

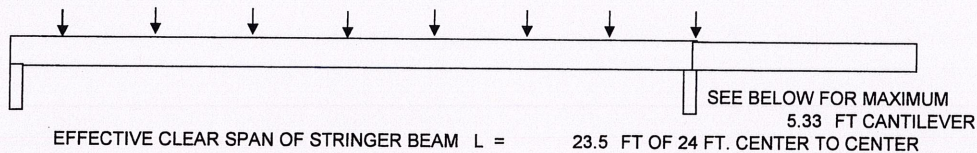
THIS CALCULATION CONSIDERS THE STEEL STRINGER BEAM CARRYING THE TRIBUTARY LOAD TO THE RAKER BEAMS.
PROJECT REF: LEE'S SUMMIT - KANSAS CITY - 48523.1A

STRINGER SPACING = 6 FT O.C.
LOAD TO STRINGER = 720 PLF

TOTAL BLEACHER DEAD LOAD = 10 PSF
LIVE LOAD = 100 PSF
FOOTBOARD / SEATBOARD SPACING = 2 FT O.C.
FOOTBOARD / SEATBOARD LOADING = 120 PLF
NOTE - 120 PLF FOR EACH FOOTBOARD / SEATBOARD
EQUATES TO 110 PSF - WORST CASE
P - CONCENTRATED LOAD TO RAKER = 12960.00 LBS

BLEACHER TRIB. WIDTH TO RAKER BEAM = 18 FT O.C. INCLUDES CANTILEVER AT TOP AND PRESSBOX REAC.
APPLIED UNIFORM BEAM DEAD LOAD AT BEAM = $Wd = 26.00$ PLF

THE CONCENTRATED LOAD P IS
APPLIED SEPERATELY FROM
THE RAKER BEAM DEAD LOAD.



APPLIED BENDING MOMENT TO EACH STRINGER BEAM $M = Wd^2/8 = 51497.3$ FT-LBS

BM DEAD LOAD = 26 PLF
STRINGER BEAM = USE W12 x 19 - PARTIAL COMP. WITH BLEACHERS

$I_o = 130 \text{ in}^4$	$t = 0.235 \text{ IN}$	
$S_x = 21.30 \text{ in}^3$	$d = 11.91 \text{ IN}$	
$A = 5.57 \text{ in}^2$	width = 4.005 IN	
$F_y = 50 \text{ ksi}$	LDF = 1	

RESULTANT BENDING STRESS = $f_b = M/S_x = 29012.57 \text{ psi}$
 $L_c = 4 \text{ FT O.C. FOR ULTIMATE STRESS - OK} < 2 \text{ FT SPACING}$

CHECK DEFLECTION $\delta = 5WL^4/384EI = 1.074 \text{ IN @ CENTER OF STRINGER BEAM}$

VS. ALLOWABLE DEFELCTION = $L/240 = 1.1750 \text{ IN - OK}$

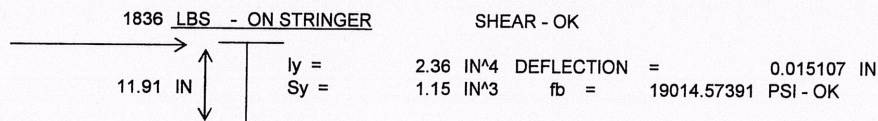
WIND UPLIFT @ 90 MPH - 12.5 PSF - NET AFTER SUBTRACTING APPLICABLE DEAD LOAD

UPLIFT REACTION = 1762.500 LBS - FOUR 5/8" x 2" BOLTS A-325 - OK

HORIZONTAL SHEAR - BASED ON 18 PSF x 10.75 FT HT./2 x 6
= 580.5 LBS - TWO 3/4" ANCHOR BOLTS - OK

REVIEW SWAY - 10 PLF LOAD PERPENDICULAR TO ROW OF BLEACHERS - REACTION = 360 LBS
LESS THAN WIND REACTION
WIND REACTION = 678.3 LBS

REVIEW SWAY PARALLEL TO ROWS OF BLEACHERS = 24 PLF x 9 ROWS x 8.5 FT
REACTION = 1836 LBS - OKAY FOR TWO 3/4" BOLTS PER ABOVE



NOTE - ACCEPTABLE DEFLECTION = 0.033083 IN - OK

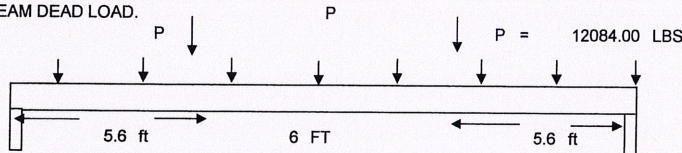
CANTILEVERED LENGTH = 5.33 FT $f_b = 1492.468 \text{ PSI}$ OVERHANGING DEFLECTION = -0.05692641 IN
VS. ALLOWABLE = $2L / 360 = 0.355333 \text{ IN - OK}$



THIS CALCULATION CONSIDERS THE STEEL RAKER BEAM CARRYING THE TRIBUTARY AND STRINGER LOADS TO THE COLUMNS OR RAKER BEAMS.
PROJECT REF: LEE'S SUMMIT - KANSAS CITY, MO 48523.1A

STRINGER SPACING = 6 FT O.C.
STRINGER LOAD = 636 PLF
TOTAL BLEACHER DEAD LOAD = 6 PSF
LIVE LOAD = 100 PSF
FOOTBOARD / SEATBOARD SPACING = 2 FT O.C.
FOOTBOARD / SEATBOARD LOADING = 120 PLF
NOTE - 120 PLF FOR EACH FOOTBOARD / SEATBOARD
EQUATES TO 100 PSF vs. 100 PSF LL
P - CONCENTRATED LOAD TO RAKER = 12084.00 LBS
BLEACHER TRIB. WIDTH TO RAKER BEAM = 19 FT
APPLIED UNIFORM BEAM DEAD LOAD AT BEAM = $Wd = 40.00$ PLF

THE CONCENTRATED LOAD P IS
APPLIED SEPERATELY FROM
THE RAKER BEAM DEAD LOAD.

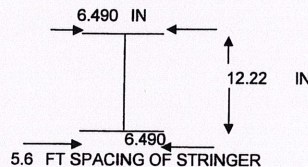


EFFECTIVE CLEAR SPAN OF RAKER BEAM $L = 17.2$ FT OF 18 FT CENTER TO CENTER SPACING

APPLIED BENDING MOMENT TO EACH RAKER BEAM $M = Wd^2/8 + Pa = 69149.6$ FT-LBS

RAKER BEAM = USE W12 x 26

$I_o = 204$ in⁴ $t = 0.230$ IN
 $S_x = 33.40$ in³ $d = 12.22$ IN
 $A = 7.65$ in² width = 6.490 IN
 $F_y = 36$ ksi LDF = 1



RESULTANT BENDING STRESS $= f_b = M/S_x = 24844.17$ psi
 $L_c = 6.9$ FT O.C. - OK VS

CHECK DEFLECTION $\delta = +Pa(3L^2 - 4a^2)/24EI = 0.582$ IN RAKER BEAM - SGL P @ 1/3 POINTS

VS. ALLOWABLE DEFELCTION $= L/360 = 0.8600$ IN - OK

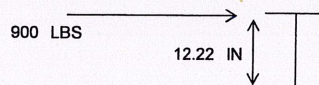
WIND UPLIFT @ 90 MPH - 10 PSF - NET AFTER SUBTRACTING APPLICABLE DEAD LOAD

UPLIFT REACTION = 3096.000 LBS - FOUR 3/4" x 18" LONG ANCHOR BOLTS - OK TO FOUNDATION

HORIZONTAL SHEAR - BASED ON 18 PSF x 13 FT HT./2 x 6
= 702 LBS - FOUR 3/4" ANCHOR BOLTS - OK

REVIEW SWAY - 10 PLF LOAD PERPENDICULAR TO ROW OF BLEACHERS - REACTION = 900 LBS
AND PERPENDICULAT TO RAKER BEAM LESS THAN WIND REACTION

$I_y = 17.3$ IN⁴ DEFLECTION = 0.001091 IN
 $S_y = 5.34$ IN³ $f_b = 2059.551$ PSI - OK
NOTE - ACCEPTABLE DEFLECTION = 0.033944 IN - OK



REVIEW SWAY PARALLEL TO RAKER BEAM = 24 PLF x 8 ROWS x 6 FT
REACTION = 1152 LBS - OKAY FOR FOUR 3/4" BOLTS PER ABOVE
1152 LBS - ON RAKER BEAM SHEAR - OK

CANTILEVERED LENGTH = 5.7 FT $f_b = 8816.074$ PSI OVERHANGING DEFLECTION
OF 6' OVERHANGING LENGTH

NOTE - CONCENTRATED LOAD IS 1/2 P = 0.430265 IN
VS. ALLOWABLE $= 2L/240 = 0.57$ IN - OK



THIS CALCULATION REVIEWS THE BRACING SYSTEM USED FOR WIND AND SEISMIC AND SWAY RESISTANCE IN THE WEAK DIRECTION OF THE COLUMN ORIENTATION FOR THE LEE'S SUMMIT PARAGON STAR - KANSAS CITY, MO

HORIZONTAL LOAD TOP OF COLUMN = 2822.4 LBS

PLACE 100% OF THE HORIZONTAL WIND LOAD AT TOP OF COLUMN TO BE CARRIED BY THE TENSION COMPONENT OF THE BRACE.

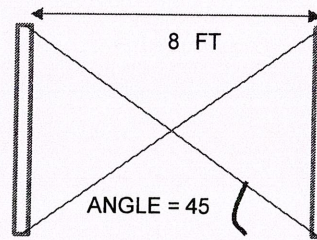
THIS IS BASED ON COMPARISON OF SWAY LOAD, SEISMIC AND HORIZONTAL WIND LOAD.

CONVERT HORIZONTAL REACTION
= 2822.4 LBS
TO ACTUAL VECTOR LOAD BASED
ON ANGLE = 3991.2 LBS

AREA OF 2 X 2 X 1/4" ANGLE = 0.938 IN²
ft = 4255.059 PSI

BOLT CONNECTION - TWO 5/8" x 2" A325 BOLTS
SHEAR CAPACITY = 7.36 KIPS >

3991.2 LBS TWO 1/2" BOLTS



8 FT - FOR WORST CASE EFFECT



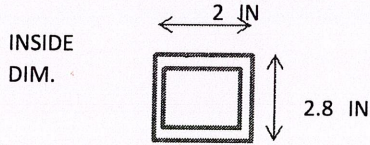
THIS CALCULATION REVIEWS THE CONCENTRATED LOAD AND/OR THE UNIFORM LOAD AS APPLIED TO THE RAILING AND ANALYZED ACCORDINGLY.

2009 VA UNIFORM BUILDING CODE
REF: 2 x 2.8 POST

LEE'S SUMMIT PARAGON STAR - KANSAS CITY, MO PROJECT: #48523.1A

CONCENTRATED LOAD = 200 LBS

ALTERNATE UNIFORM LOAD = 50 PLF



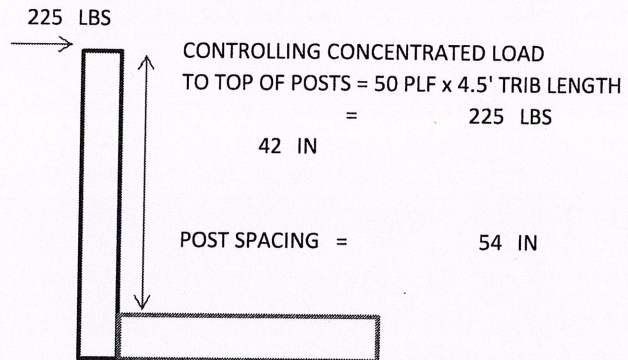
MAXIMUM APPLIED
MOMENT = 9450 IN-LBS

PHYSICAL PROPERTIES - POSTS

$I_o = 1.2405 \text{ IN}^4$ $t = 0.125 \text{ IN}$

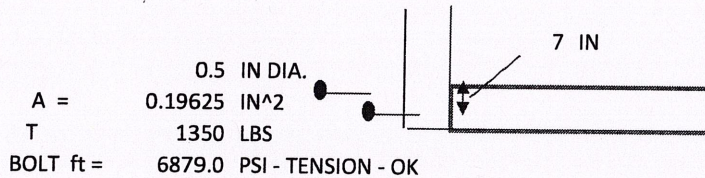
$S_x = 0.886107 \text{ IN}^3$


$f_b = 10664.63 \text{ PSI - MIN. GRADE OF ALUMINUM - } F_b' = 17774.38 \text{ USE MIN. 18 KSI ALUMINUM}$



DEFLECTION = 0.45 IN
VS. $2L / 120 = 0.7 \text{ IN}$

9450 IN-LBS



HANDRAIL - USE WORST CASE 1.625 IN DIA.  INSIDE DIA. = 0.188 IN

PHYSICAL PROPERTIES - POSTS

$I_o = 0.3422 \text{ IN}^4$ $t = 0.125 \text{ IN}$ $M_h = 2700 \text{ IN-LBS}$

$S_x = 0.421195 \text{ IN}^3$

$f_b = 6410.333 \text{ PSI - MIN. GRADE OF ALUMINUM - } F_b' = 10683.89 \text{ USE 11 KSI AL}$

DANT-CLAYTON CORP.
LOUISVILLE, KY

SUBJECT: FOOTING DESIGN

ENGR: KEVIN M. FINN, P.E., INC.
815 WATERBURY PARK DRIVE
ELKHART, IN 46517
MO P.E. LIC. NO. 028788
FIRM NO. 2012002161

THIS IS AN ANALYSIS - DESIGN OF THE FOUNDATION SYSTEM FOR LEE'S SUMMIT - 48523.1A

PIER /FTG DEAD LOAD = 8232 LBS SOIL BEARING CAPACITY = 2000 PSF
(7' x 7' x 1')

(PIER LOAD + PIER DEAD WEIGHT + FOOTING
DEAD LOAD) / FOOTING SOIL BEARING CAP.

MAXIMUM REACTION FROM GIRDER CALC

PIER LOAD (K - 1000 lbs)	TOTAL LOAD TO BASE OF FOOTING	RESULTANT MIN. FOOTING SIZE	FOOTING SIZE AS DIMENSIONED
45.756	53988 LBS	26.99 FT ²	84" x 84" x 12" THICK

REVIEW OVERTURNING -

APPLIED WIND MOMENT = 14157 FT-LBS
11' TRIBUTARY BLEACHER HT.

84 IN - 2000 PSF OKAY FOR SOIL BEARING CAPACITY

FIVE #5 REBAR - OK
EACH DIRECTION

12" O.C. SPACING OF REBAR - OK



RESISTING DEAD LOAD MOMENT = 8232 LBS x 3.5 FT x 0.6 = 17287.2 FT-LBS > 14157

DIRECT UPLIFT REACTION = 3088.8 LBS - NET 6 PSF X TRIB. LENGTH X TRIB. WIDTH - TWO 3/4" ANCHOR BOLTS OK



DANT CLAYTON CORP.
LOUISVILLE, KY

SUBJECT: COLUMN TIEDOWN REVIEW

ENGR: KEVIN M. FINN, P.E., INC.
815 WATERBURY PARK DRIVE
ELKHART, IN 46517
MO P.E. LIC. NO. 028788
FIRM NO. 20122002161

THIS CALCULATION CONSIDERS THE STEEL COLUMN ANALYSIS AND THE TIEDOWN TO THE PIER.
LEE'S SUMMIT - KANSAS CITY - PARAGON STAR
WIND SPEED - 115 MPH, EXP. C

IMPORTANCE FACTOR - 1
TOTAL C_p = 1
NOMINAL HORIZ. WIND LOAD : 10.7 PSF
TRIBUTARY HT. = 9 FT

TOTAL WIND LOAD USED TO BE RESISTED BY TIEDOWN DESIGN = 10.70 PSF

TRIB. WIDTH = 6 FT

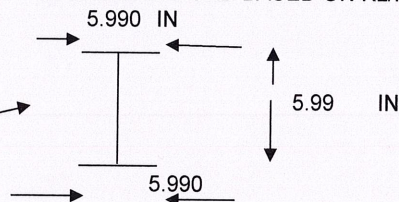
APPLIED UNIFORM UPLIFT LOAD AT RAKER BEAM 64.20 PLF

CTR BRACED COLUMN = USE W6 X 15

L_u = 15.75 ft
 I_o = 29.100
 S_x = 9.7200
 A = 4.430
 F_y = 36 ksi
 r = 2.563 IN
 t = 0.233 IN
 d = 5.99 IN
width = 5.990 IN
LDF = 1

3/16" THICK

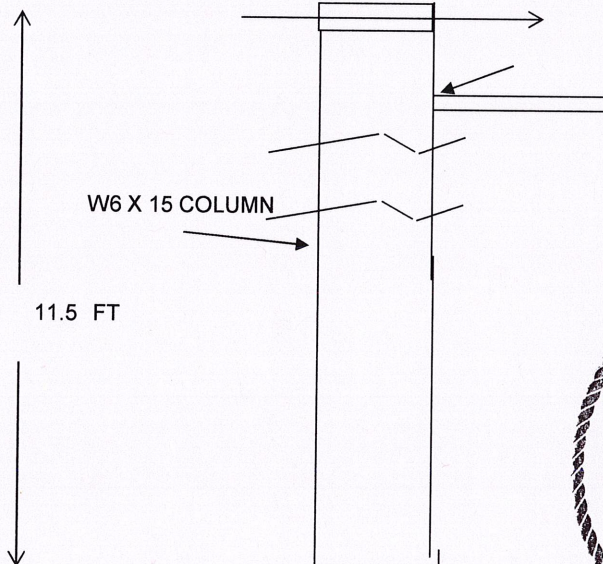
MAXIMUM APPLIED VERTICAL LOAD @ COLUMN =
MAX. CONC. LOAD BASED ON K_L/R_y = 58



THE BRACE SYSTEM IS AT TOP / BOTTOM
FOR WIND LOAD.

WIND UPLIFT REACTION AT COLUMN = 1237.5 LBS - FROM RAKER BEAM CALC

HORIZONTAL REACTION = 577.8 LBS TO COLUMN IN STRONG DIRECTION



APPLIED BENDING MOMENT
= 6644.7 FT-LBS
ALLOWABLE BM = 209.9520 KIP-FT
 f_b = 8203.333 PSI - OK IN WIND

DEFLECTION = 0.419856 IN
VS. ALLOWABLE = 1.533333 IN

